Low-Cost Cookstove

Under a work for others agreement Oak Ridge National Laboratory (ORNL), Colorado State University (CSU), and Envirofit developed the metal combustor component and cookstove assembly for the G-3300 clean cookstove (Figure 1.) ORNL provided ongoing alloy specification and impurity tolerance input, and assisted with the design and interpretation of corrosion studies to assess the durability of candidate alloys. ORNL also performed advanced characterization of corrosion products on laboratory and field-tested metal components. This knowledge transfer resulted in a joint patent disclosure between Envirofit, CSU, and ORNL.

In 2007, Envirofit and Colorado State approached ORNL in search of guidance for selecting a commercially available low-cost metal combustor alloy able to withstand harsh operating conditions. The combustor component in the Envirofit stove design had to resist temperatures up to 1,650 degrees Fahrenheit in the presence of corrosive compounds resulting from burning a variety of biomass. Moreover, the metal cost could not exceed a few dollars per pound. Mike Brady, Materials Science and Technology Division, led a team that identified a family of low-cost iron-based alloys with the potential to meet Envirofit's design targets by leveraging extensive experience in high-temperature materials gained under the Department of Energy's Energy Efficiency and Renewable Energy Industrial Technologies programs and Fossil Energy Advanced Research Materials programs. ORNL also performed advanced characterization of corrosion products on laboratory and field-tested metal components and assisted Envirofit in specifying alloy compositional tolerances needed to achieve durability targets without significantly increasing alloy cost.

The metal combustor component and cookstove assembly developed by ORNL, Envirofit, and CSU won a 2012 Federal Laboratory Consortium (FLC) award for excellence in technology transfer for a clean-burning cookstove designed for the developing world. The FLC (http://www.federallabs.org/), organized in 1974, is a nationwide network of federal laboratories that provides the forum to develop strategies and opportunities for linking laboratory mission technologies and expertise with the marketplace. Today, more than 250 federal laboratories and centers and their parent departments and agencies are FLC members.

Envirofit is a non-profit company that manufactures low-cost, low-emission clean cookstoves for the developing world. The Envirofit’s G-3300 clean cookstove (Figure 1) offers up to an 80% reduction in smoke and harmful gasses, reduces biomass fuel use by up to 60%, and reduces cooking time by up to 50% compared with traditional cooking fires/stoves. It was launched in summer of 2009 and thus far, over 300,000 units have been sold in the developing world. The core metal combustor technology developed for the G-3300 has now been integrated across six models of wood and charcoal stoves.

Figure 1 – Envirofit G3300 clean cook-stove utilizing a metallic Fe-base combustor component (photo courtesy of Envirofit). The G3300 reduces smoke and harmful gasses by up to 80%, biomass fuel use by up to 60%, and reduces cooking time by up to 50%.